

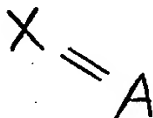
APPENDIX A

Re: U.S. Patent Application No. 09/285,937

Our Ref.: 616758-3/JP

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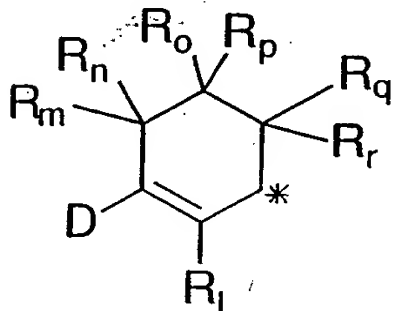
Claim 1. (amended once) A compound having a formula A:



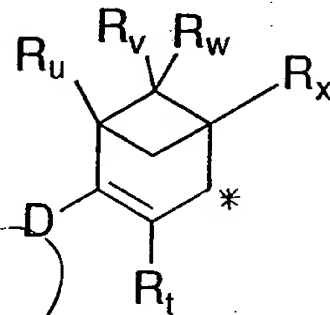
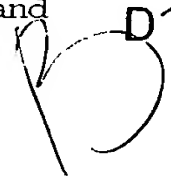
(formula A)

wherein X is selected from the group consisting of

A1



and



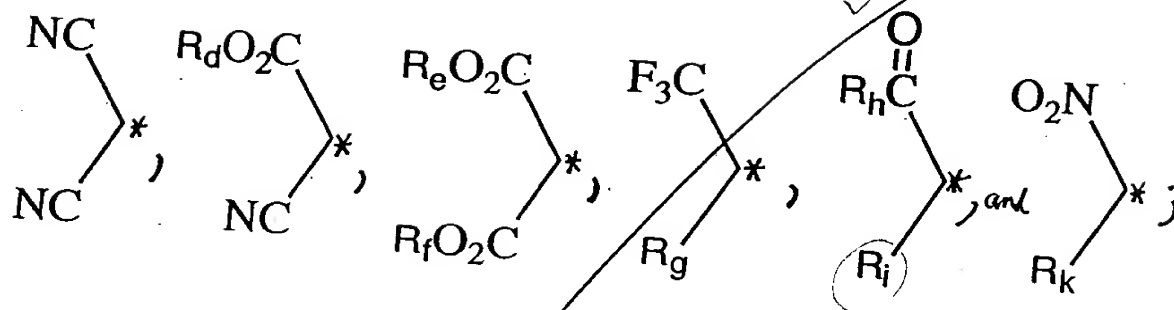
;

wherein D is selected from the group consisting of NR_aR_b , OR_a , SR_a , PR_aR_b , and R_c ;

wherein A is selected from the group consisting of:

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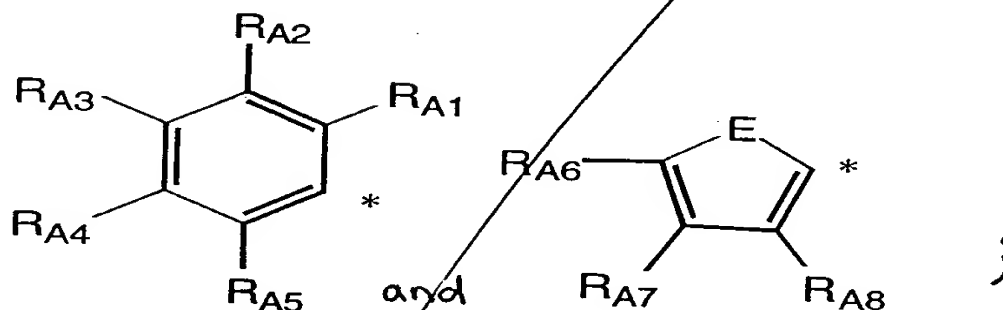
wherein R_a , R_b , and R_c are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic alkyl group; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{OR}_{A1}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{NR}_{A2}\text{R}_{A3}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{CN}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{Cl}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{Br}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{I}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{-Phenyl}$; $-(\text{CH}_2)_\alpha(\text{CF}_2)_\gamma\text{CF}_3$; and an aryl group;

wherein R_d , R_e , R_f , R_i , R_m , R_n , R_o , R_p , R_q , R_r , R_s , R_t , R_u , R_v , R_w , and R_x are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic hydrocarbon group that is saturated or unsaturated; a linear, branched, or cyclic alkyl group; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{OR}_{A1}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{NR}_{A2}\text{R}_{A3}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{CN}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{Cl}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{Br}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{I}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{-Phenyl}$; $-(\text{CH}_2)_\alpha(\text{CF}_2)_\gamma\text{CF}_3$; and an aryl group;

wherein R_g , R_h , R_i , and R_k are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic hydrocarbon group that is saturated or unsaturated; a linear, branched, or cyclic alkyl group; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{OR}_{A1}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{NR}_{A2}\text{R}_{A3}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{CN}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{Cl}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{Br}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{I}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{-Phenyl}$; an aryl group; $-(\text{CH}_2)_\alpha(\text{CF}_2)_\gamma\text{CF}_3$; $-\text{CO}_2\text{R}_d$; and $-\text{COR}_d$;

APPENDIX A

wherein each aryl group is optionally independently selected from the group consisting of



wherein R_{A1} , R_{A2} , R_{A3} , R_{A4} , R_{A5} , R_{A6} , R_{A7} , and R_{A8} are the same or different and are each independently selected from the group consisting of H, a linear alkyl group, a branched alkyl group, and a cyclic alkyl group;

wherein E is selected from the group consisting of S, O, and NR_s ;

wherein the alkyl group is optionally substituted or unsubstituted and optionally includes up to 25 carbon atoms;

wherein α is an integer that is greater than or equal to 0 and less than or equal to 25;

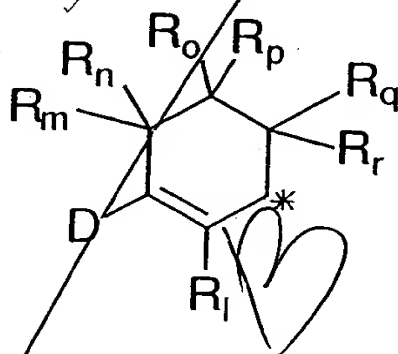
wherein β is an integer that is greater than or equal to 0 and less than or equal to 25;

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wherein γ is an integer that is greater than or equal to 0 and less than or equal to 25; and

when: D is CH_3 ; R_m , R_n , R_q , and R_r are each H; R_o is H or CH_3 ;

R_p is H or CH_3 ; and X is



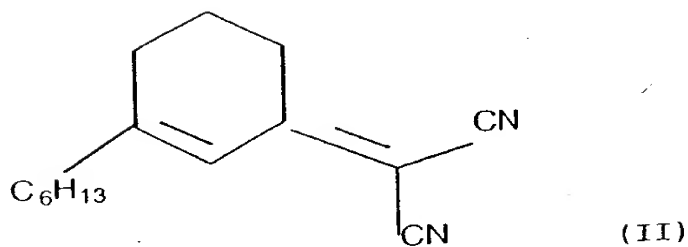
then A is not $\text{C}(\text{CN})(\text{CN})$.

A,
cont.

Claim 2. (amended once) A compound as claimed in Claim 1, wherein R_1 , R_m , R_n , R_o , R_p , R_q , R_r , R_t , R_u , R_v , R_w , and R_x are each H; wherein A is $\text{C}(\text{CN})(\text{CN})$; and wherein D is R_y or OR_y , and wherein R_y is selected from the group consisting of the linear alkyl group, the branched alkyl group, the cyclic alkyl group, and the aryl group.

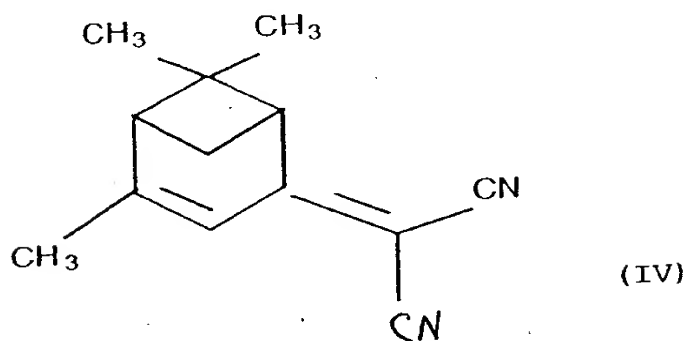
Claim 3. (amended once) A compound as claimed in Claim 1, wherein the compound is selected from the group consisting of

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A₁
cont.

and

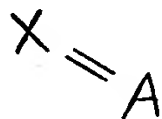


Claim 7. (amended once) A liquid-crystal dopant comprising the compound claimed in Claim 1, wherein the liquid-crystal dopant has: (1) at about 20-30°C an absorption loss in a visible region of less than or equal to about 5%; (2) at about 20-30°C a dielectric anisotropy of greater than about 50; and (3) at about 20-30°C a viscosity lower than about 50 centipoise.

A₂

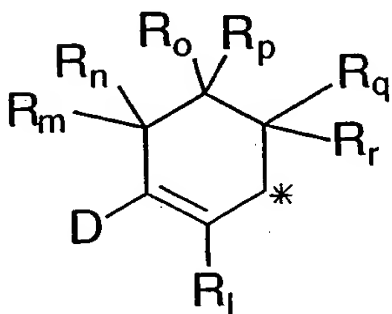
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Claim 9. (amended once) A composition comprising a liquid-crystal mixture and a compound having a formula A:

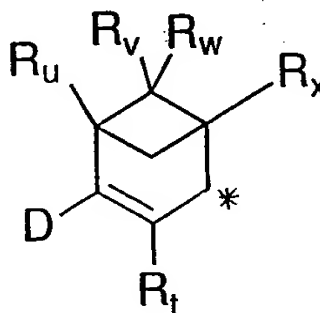


(formula A)

wherein X is selected from the group consisting of



and

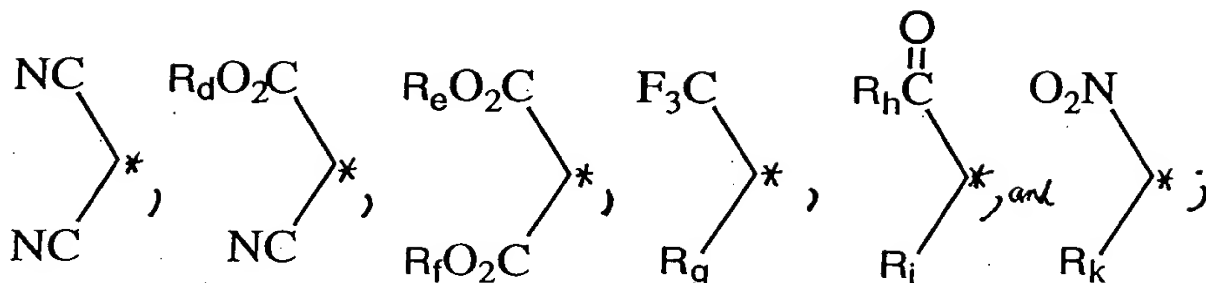


;

wherein D is selected from the group consisting of NR_aR_b , OR_a , SR_a , PR_aR_b , and R_c ;

wherein A is selected from the group consisting of:

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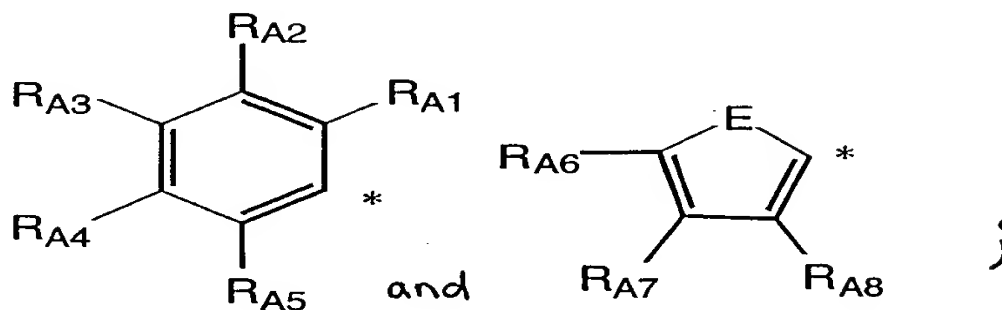
wherein R_a , R_b , and R_c are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic alkyl group; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{OR}_{A1}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{NR}_{A2}\text{R}_{A3}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{CN}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{Cl}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{Br}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{I}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{-Phenyl}$; $-(\text{CH}_2)_\alpha(\text{CF}_2)_\gamma\text{CF}_3$; and an aryl group;

wherein R_d , R_e , R_f , R_l , R_m , R_n , R_o , R_p , R_q , R_r , R_s , R_t , R_u , R_v , R_w , and R_x are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic hydrocarbon group that is saturated or unsaturated; a linear, branched, or cyclic alkyl group; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{OR}_{A1}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{NR}_{A2}\text{R}_{A3}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{CN}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{Cl}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{Br}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{I}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{-Phenyl}$; $-(\text{CH}_2)_\alpha(\text{CF}_2)_\gamma\text{CF}_3$; and an aryl group;

wherein R_g , R_h , R_i , and R_k are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic hydrocarbon group that is saturated or unsaturated; a linear, branched, or cyclic alkyl group; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{OR}_{A1}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{NR}_{A2}\text{R}_{A3}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{CN}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{Cl}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{Br}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{I}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{-Phenyl}$; an aryl group; $-(\text{CH}_2)_\alpha(\text{CF}_2)_\gamma\text{CF}_3$; $-\text{CO}_2\text{R}_d$; and $-\text{COR}_d$;

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wherein each aryl group is optionally independently selected from the group consisting of



wherein R_{A1} , R_{A2} , R_{A3} , R_{A4} , R_{A5} , R_{A6} , R_{A7} , and R_{A8} are the same or different and are each independently selected from the group consisting of H, a linear alkyl group, a branched alkyl group, and a cyclic alkyl group;

A3
cont. wherein E is selected from the group consisting of S, O, and NR_s ;

wherein the alkyl group is optionally substituted or unsubstituted and optionally includes up to 25 carbon atoms;

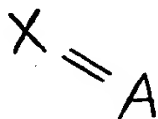
wherein α is an integer that is greater than or equal to 0 and less than or equal to 25;

wherein β is an integer that is greater than or equal to 0 and less than or equal to 25; and

wherein γ is an integer that is greater than or equal to 0 and less than or equal to 25.

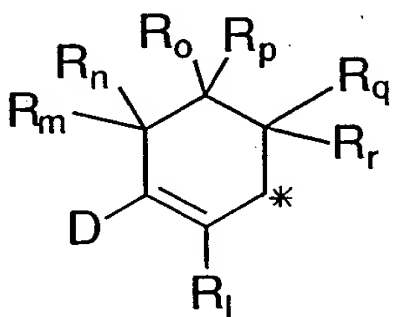
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Claim 11. (amended once) A method for reducing an operation voltage of a liquid-crystal mixture, the method comprising adding to the liquid-crystal mixture a compound having a formula A:

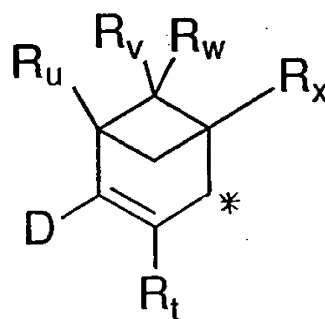


(formula A)

wherein X is selected from the group consisting of



and

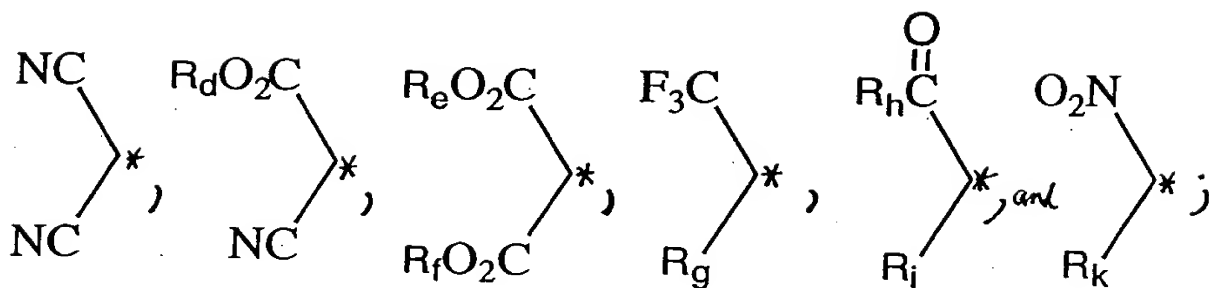


;

wherein D is selected from the group consisting of NR_aR_b , OR_a , SR_a , PR_aR_b , and R_c ;

wherein A is selected from the group consisting of:

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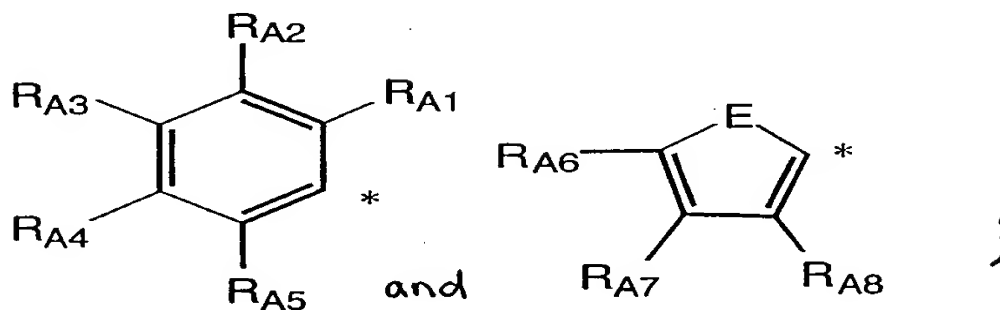
wherein R_a , R_b , and R_c are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic alkyl group; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{OR}_{A1}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{NR}_{A2}\text{R}_{A3}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{CN}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{Cl}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{Br}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{I}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{-Phenyl}$; $-(\text{CH}_2)_\alpha(\text{CF}_2)_\gamma\text{CF}_3$; and an aryl group;

AA cont. wherein R_d , R_e , R_f , R_l , R_m , R_n , R_o , R_p , R_q , R_r , R_s , R_t , R_u , R_v , R_w , and R_x are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic hydrocarbon group that is saturated or unsaturated; a linear, branched, or cyclic alkyl group; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{OR}_{A1}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{NR}_{A2}\text{R}_{A3}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{CN}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{Cl}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{Br}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{I}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{-Phenyl}$; $-(\text{CH}_2)_\alpha(\text{CF}_2)_\gamma\text{CF}_3$; and an aryl group;

wherein R_g , R_h , R_i , and R_k are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic hydrocarbon group that is saturated or unsaturated; a linear, branched, or cyclic alkyl group; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{OR}_{A1}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{NR}_{A2}\text{R}_{A3}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{CN}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{Cl}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{Br}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{I}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{-Phenyl}$; an aryl group; $-(\text{CH}_2)_\alpha(\text{CF}_2)_\gamma\text{CF}_3$; $-\text{CO}_2\text{R}_d$; and $-\text{COR}_d$;

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wherein each aryl group is optionally independently selected from the group consisting of



wherein R_{A1} , R_{A2} , R_{A3} , R_{A4} , R_{A5} , R_{A6} , R_{A7} , and R_{A8} are the same or different and are each independently selected from the group consisting of H, a linear alkyl group, a branched alkyl group, and a cyclic alkyl group;

A4
cont wherein E is selected from the group consisting of S, O, and NR_s ;

wherein the alkyl group is optionally substituted or unsubstituted and optionally includes up to 25 carbon atoms;

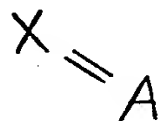
wherein α is an integer that is greater than or equal to 0 and less than or equal to 25;

wherein β is an integer that is greater than or equal to 0 and less than or equal to 25; and

wherein γ is an integer that is greater than or equal to 0 and less than or equal to 25.

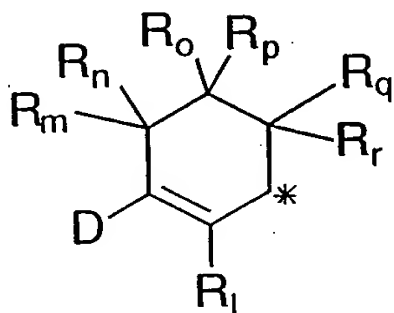
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Claim 13. (amended once) A method for tuning a clearing temperature of a liquid-crystal mixture, the method comprising adding to the liquid-crystal mixture 1 a compound having a formula A:

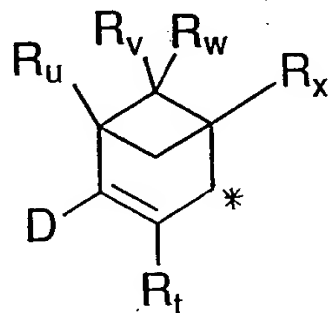


(formula A)

wherein X is selected from the group consisting of



and

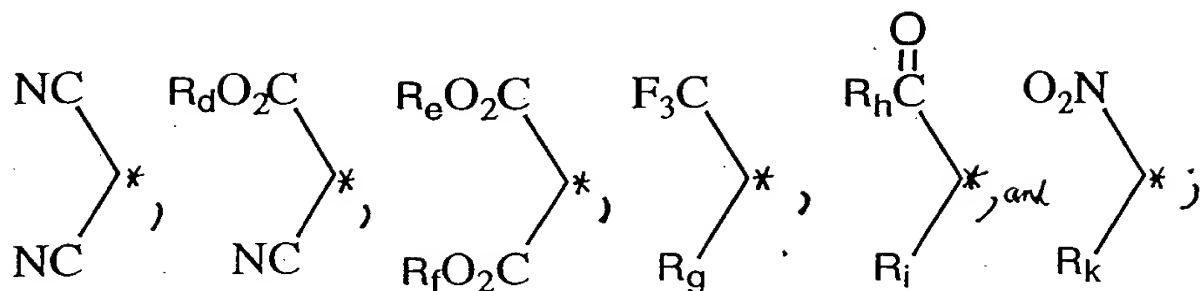


;

wherein D is selected from the group consisting of NR_aR_b, OR_a, SR_a, PR_aR_b, and R_c;

wherein A is selected from the group consisting of:

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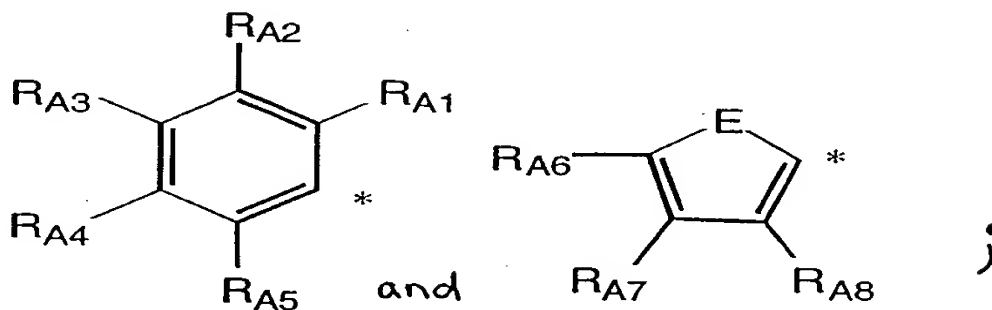
wherein R_a , R_b , and R_c are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic alkyl group; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{OR}_{A1}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{NR}_{A2}\text{R}_{A3}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{CN}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{Cl}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{Br}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{I}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{-Phenyl}$; $-(\text{CH}_2)_\alpha(\text{CF}_2)_\gamma\text{CF}_3$; and an aryl group;

AS
cont. wherein R_d , R_e , R_f , R_l , R_m , R_n , R_o , R_p , R_q , R_r , R_s , R_t , R_u , R_v , R_w , and R_x are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic hydrocarbon group that is saturated or unsaturated; a linear, branched, or cyclic alkyl group; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{OR}_{A1}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{NR}_{A2}\text{R}_{A3}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{CN}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{Cl}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{Br}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{I}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{-Phenyl}$; $-(\text{CH}_2)_\alpha(\text{CF}_2)_\gamma\text{CF}_3$; and an aryl group;

wherein R_g , R_h , R_i , and R_k are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic hydrocarbon group that is saturated or unsaturated; a linear, branched, or cyclic alkyl group; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{OR}_{A1}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{NR}_{A2}\text{R}_{A3}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{CN}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{Cl}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{Br}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{I}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{-Phenyl}$; an aryl group; $-(\text{CH}_2)_\alpha(\text{CF}_2)_\gamma\text{CF}_3$; $-\text{CO}_2\text{R}_d$; and $-\text{COR}_d$;

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wherein each aryl group is optionally independently selected from the group consisting of



wherein R_{A1} , R_{A2} , R_{A3} , R_{A4} , R_{A5} , R_{A6} , R_{A7} , and R_{A8} are the same or different and are each independently selected from the group consisting of H, a linear alkyl group, a branched alkyl group, and a cyclic alkyl group;

A5
cont. wherein E is selected from the group consisting of S, O, and NR_s ;

wherein the alkyl group is optionally substituted or unsubstituted and optionally includes up to 25 carbon atoms;

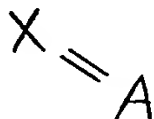
wherein α is an integer that is greater than or equal to 0 and less than or equal to 25;

wherein β is an integer that is greater than or equal to 0 and less than or equal to 25; and

wherein γ is an integer that is greater than or equal to 0 and less than or equal to 25.

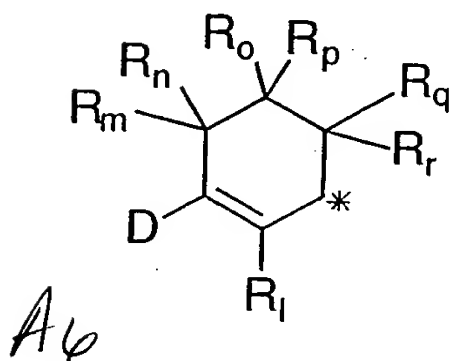
APPENDIX A

Claim 15. (amended once) A method for tuning birefringence of a liquid-crystal mixture, the method comprising adding to the liquid-crystal mixture a compound having a formula A:

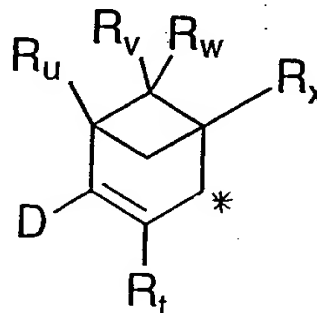


(formula A)

wherein X is selected from the group consisting of



and



wherein D is selected from the group consisting of NR_aR_b , OR_a , SR_a , PR_aR_b , and R_c ;

wherein A is selected from the group consisting of:

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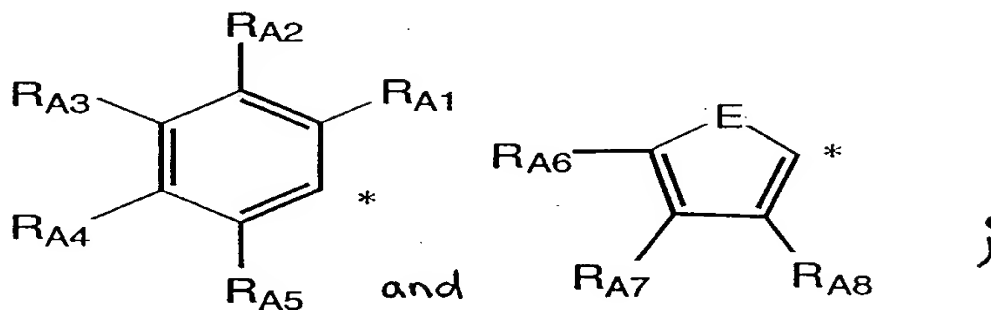


wherein R_d , R_e , R_f , R_l , R_m , R_n , R_o , R_p , R_q , R_r , R_s , R_t , R_u , R_v , R_w , and R_x are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic hydrocarbon group that is saturated or unsaturated; a linear, branched, or cyclic alkyl group; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta OR_{A1}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta NR_{A2}R_{A3}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta CN$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Cl$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Br$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta I$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta$ -Phenyl; $-(CH_2)_\alpha(CF_2)_\gamma CF_3$; and an aryl group;

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APPENDIX A

wherein each aryl group is optionally independently selected from the group consisting of



wherein R_{A1} , R_{A2} , R_{A3} , R_{A4} , R_{A5} , R_{A6} , R_{A7} , and R_{A8} are the same or different and are each independently selected from the group consisting of H, a linear alkyl group, a branched alkyl group, and a cyclic alkyl group;

A6
cont. wherein E is selected from the group consisting of S, O, and NR_s ;

wherein the alkyl group is optionally substituted or unsubstituted and optionally includes up to 25 carbon atoms;

wherein α is an integer that is greater than or equal to 0 and less than or equal to 25;

wherein β is an integer that is greater than or equal to 0 and less than or equal to 25; and

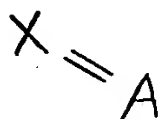
APPENDIX A

A6
cont. wherein γ is an integer that is greater than or equal to 0 and less than or equal to 25.

A7
Claim 17. (amended once) A method for increasing a $\partial n / \partial T$ of a liquid-crystal mixture, the method comprising adding a compound to the liquid-crystal mixture to yield a resulting mixture; wherein the resulting mixture at about 20-30°C has a $\partial n / \partial T$ larger than about 0.005, wherein n is a

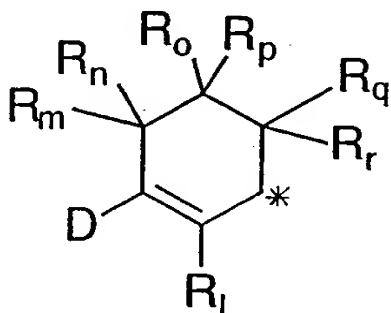
APPENDIX A

refractive index of the resulting mixture and T is a temperature of the resulting mixture in °C; and wherein the compound has a formula A:

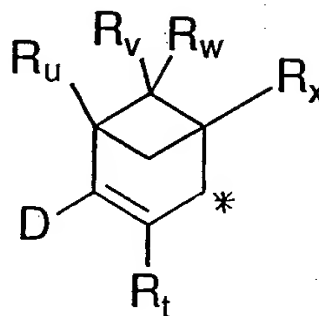


(formula A)

wherein X is selected from the group consisting of



and

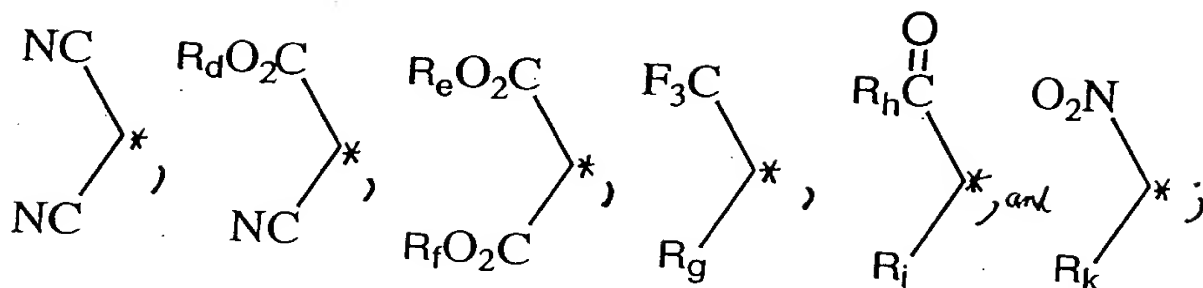


;

wherein D is selected from the group consisting of NR_aR_b , OR_a , SR_a , PR_aR_b , and R_c ;

wherein A is selected from the group consisting of:

APPENDIX A



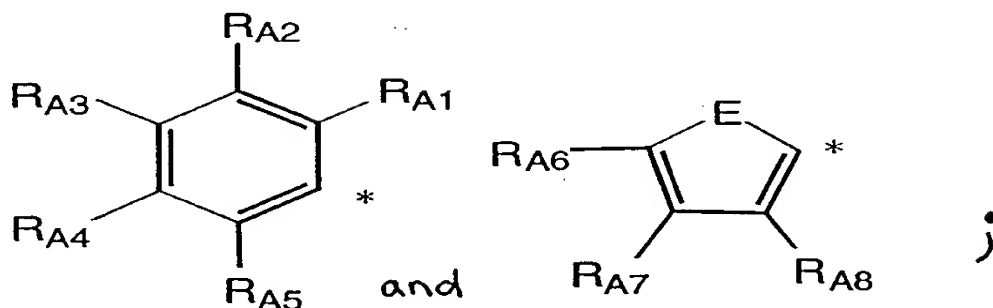
wherein R_a , R_b , and R_c are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic alkyl group; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{OR}_{A1}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{NR}_{A2}\text{R}_{A3}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{CN}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{Cl}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{Br}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{I}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{-Phenyl}$; $-(\text{CH}_2)_\alpha(\text{CF}_2)_\gamma\text{CF}_3$; and an aryl group;

wherein R_d , R_e , R_f , R_l , R_m , R_n , R_o , R_p , R_q , R_r , R_s , R_t , R_u , R_v , R_w , and R_x are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic hydrocarbon group that is saturated or unsaturated; a linear, branched, or cyclic alkyl group; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{OR}_{A1}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{NR}_{A2}\text{R}_{A3}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{CN}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{Cl}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{Br}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{I}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{-Phenyl}$; $-(\text{CH}_2)_\alpha(\text{CF}_2)_\gamma\text{CF}_3$; and an aryl group;

wherein R_g , R_h , R_i , and R_k are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic hydrocarbon group that is saturated or unsaturated; a linear, branched, or cyclic alkyl group; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{OR}_{A1}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{NR}_{A2}\text{R}_{A3}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{CN}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{Cl}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{Br}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{I}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{-Phenyl}$; an aryl group; $-(\text{CH}_2)_\alpha(\text{CF}_2)_\gamma\text{CF}_3$; $-\text{CO}_2\text{R}_d$; and $-\text{COR}_d$;

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wherein each aryl group is optionally independently selected from the group consisting of



wherein RA1, RA2, RA3, RA4, RA5, RA6, RA7, and RA8 are the same or different and are each independently selected from the group consisting of H, a linear alkyl group, a branched alkyl group, and a cyclic alkyl group;

wherein E is selected from the group consisting of S, O, and NR_s;

A7
cont. wherein the alkyl group is optionally substituted or unsubstituted and optionally includes up to 25 carbon atoms;

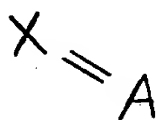
wherein α is an integer that is greater than or equal to 0 and less than or equal to 25;

wherein β is an integer that is greater than or equal to 0 and less than or equal to 25; and

wherein γ is an integer that is greater than or equal to 0 and less than or equal to 25.

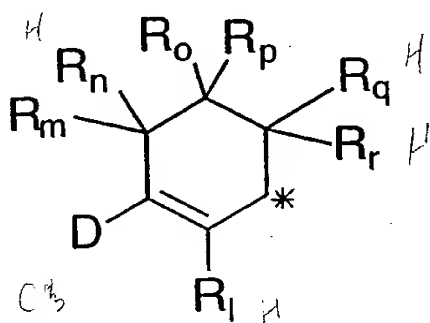
APPENDIX A

Claim 19. (amended once) A compound having a formula A:

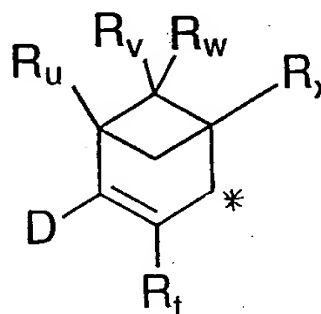


(formula A)

wherein X is selected from the group consisting of



and

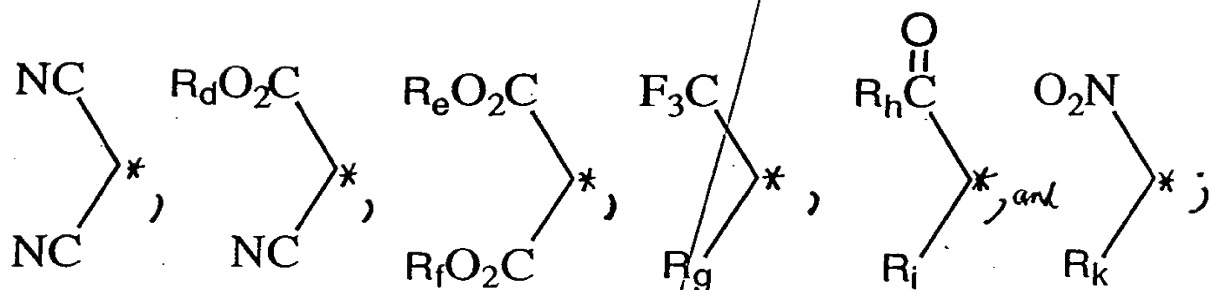


;

wherein D is selected from the group consisting of NR_aR_b , OR_a , SR_a , PR_aR_b , and R_c ;

wherein A is selected from the group consisting of:

APPENDIX A



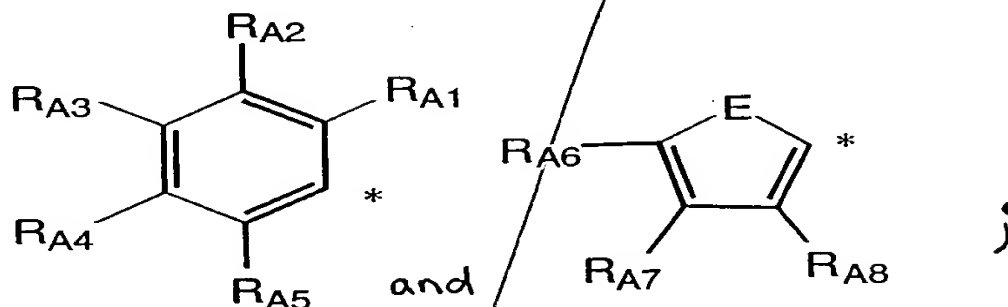
wherein $R_a, R_b,$ and R_c are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic alkyl group; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{OR}_{A1}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{NR}_{A2}\text{R}_{A3}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{CN}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{Cl}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{Br}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{I}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{-Phenyl}$; $-(\text{CH}_2)_\alpha(\text{CF}_2)_\gamma\text{CF}_3$; and an aryl group;

As
cont. wherein $R_d, R_e, R_f, R_l, R_m, R_n, R_o, R_p, R_q, R_r, R_s, R_t, R_u, R_v, R_w,$ and R_x are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic hydrocarbon group that is saturated or unsaturated; a linear, branched, or cyclic alkyl group; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{OR}_{A1}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{NR}_{A2}\text{R}_{A3}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{CN}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{Cl}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{Br}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{I}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{-Phenyl}$; $-(\text{CH}_2)_\alpha(\text{CF}_2)_\gamma\text{CF}_3$; and an aryl group;

wherein $R_g, R_h, R_i,$ and R_k are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic hydrocarbon group that is saturated or unsaturated; a linear, branched, or cyclic alkyl group; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{OR}_{A1}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{NR}_{A2}\text{R}_{A3}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{CN}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{Cl}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{Br}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{I}$; $-(\text{CH}_2\text{CH}_2\text{O})_\alpha-(\text{CH}_2)_\beta\text{-Phenyl}$; an aryl group; $-(\text{CH}_2)_\alpha(\text{CF}_2)_\gamma\text{CF}_3$; $-\text{CO}_2\text{R}_d$; and $-\text{COR}_d$;

APPENDIX A

wherein each aryl group is optionally independently selected from the group consisting of



wherein R_{A1} , R_{A2} , R_{A3} , R_{A4} , R_{A5} , R_{A6} , R_{A7} , and R_{A8} are the same or different and are each independently selected from the group consisting of H, a linear alkyl group, a branched alkyl group, and a cyclic alkyl group;

wherein E is selected from the group consisting of S, O, and NR_s ;

wherein the alkyl group is optionally substituted or unsubstituted and optionally includes up to 25 carbon atoms;

wherein α is an integer that is greater than or equal to 0 and less than or equal to 25;

wherein β is an integer that is greater than or equal to 0 and less than or equal to 25;

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wherein γ is an integer that is greater than or equal to 0 and less than or equal to 25.

wherein when D is NR_aR_b , then α is greater than or equal to 1 and less than or equal to 25;

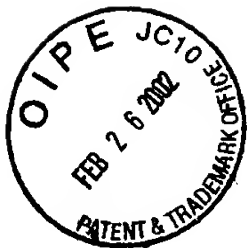
wherein when R_1 , R_m , R_n , R_q , and R_r are each H, and R_o , R_p , and D are each $-\text{CH}_3$, A is not $\text{C}(\text{CN})(\text{CN})$;

wherein when R_1 , R_m , R_n , R_o , and R_p are each H, and R_q , R_r , and D are each $-\text{CH}_3$, A is not $\text{C}(\text{CN})(\text{CN})$;

wherein when R_1 , R_o , R_p , R_q , and R_r are each H, and R_n , R_m , and D are each $-\text{CH}_3$, A is not $\text{C}(\text{CN})(\text{CN})$; and

wherein when R_1 , R_m , R_n , R_o , R_p , R_q , and R_r are each H, and D is $-\text{CH}_3$, A is not $\text{C}(\text{CN})(\text{CN})$.

As
cont.



APPENDIX C

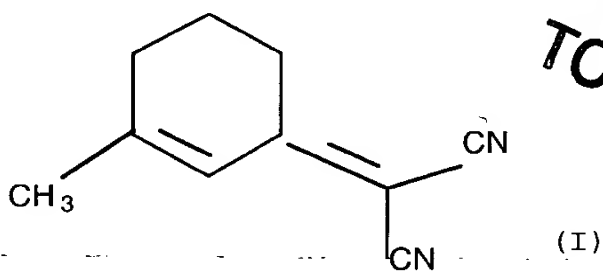
Re: U.S. Patent Application No. 09/285,937

Our Ref.: 616758-3/JP

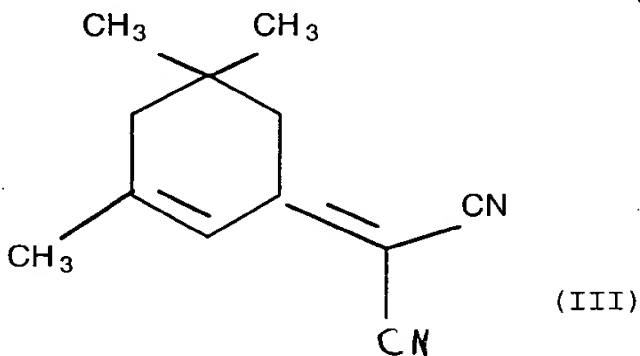
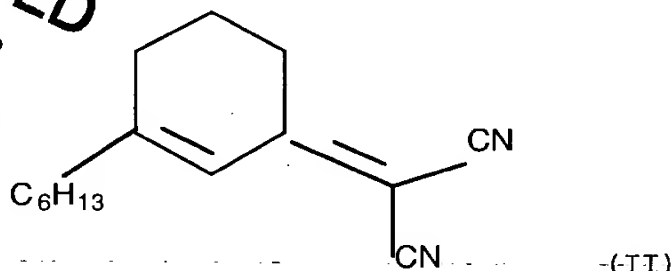
Please add the following new claims.

--21. A composition as claimed in Claim 9, wherein R_1 , R_m , R_n , R_o , R_p , R_q , R_r , R_t , R_u , R_v , R_w , and R_x are each H; wherein A is $C(CN)(CN)$; and wherein D is R_y or OR_y , and wherein R_y is selected from the group consisting of the linear alkyl group, the branched alkyl group, the cyclic alkyl group, and the aryl group.

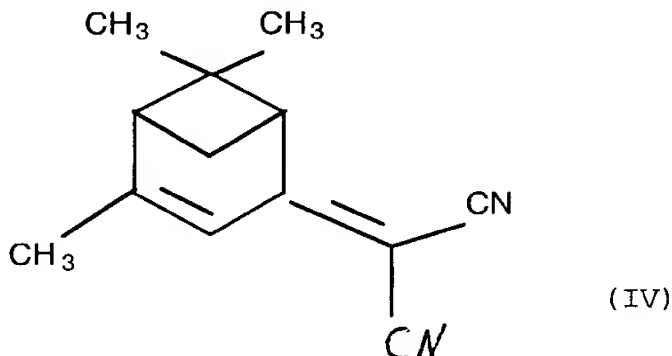
22. A composition as claimed in Claim 9, wherein the compound is selected from the group consisting of



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and



APPENDIX C

23. A composition as claimed in Claim 9, wherein when D is NR_aR_b , then α is greater than or equal to 1 and less than or equal to 25;

wherein when R_1 , R_m , R_n , R_q , and R_r are each H, and R_o , R_p , and D are each $-\text{CH}_3$, A is not $\text{C}(\text{CN})(\text{CN})$;

wherein when R_1 , R_m , R_n , R_o , and R_p are each H, and R_q , R_r , and D are each $-\text{CH}_3$, A is not $\text{C}(\text{CN})(\text{CN})$;

wherein when R_1 , R_o , R_p , R_q , and R_r are each H, and R_n , R_m , and D are each $-\text{CH}_3$, A is not $\text{C}(\text{CN})(\text{CN})$; and

wherein when R_1 , R_m , R_n , R_o , R_p , R_q , and R_r are each H, and D is $-\text{CH}_3$, A is not $\text{C}(\text{CN})(\text{CN})$.

24. A composition as claimed in Claim 21, wherein the composition is a liquid-crystal composition.

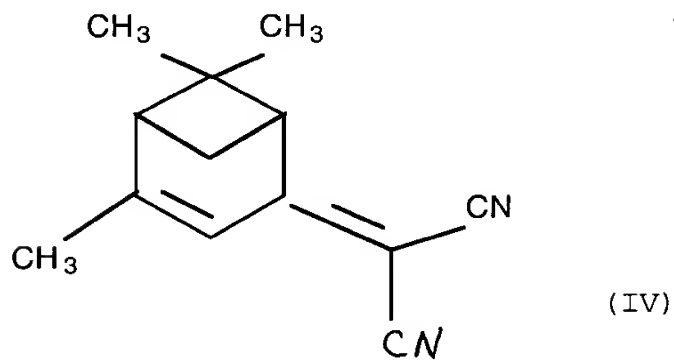
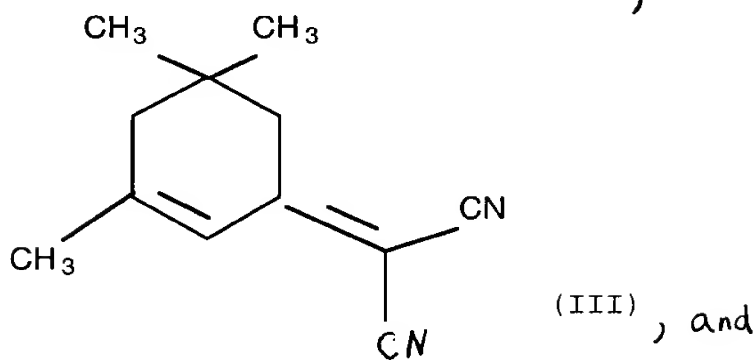
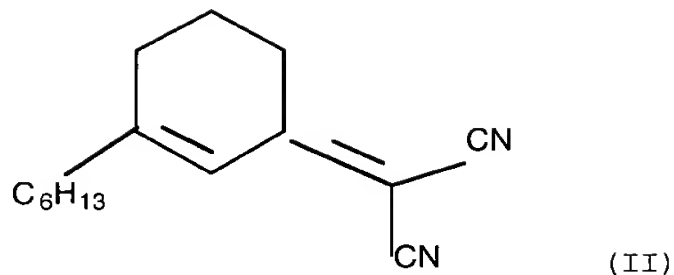
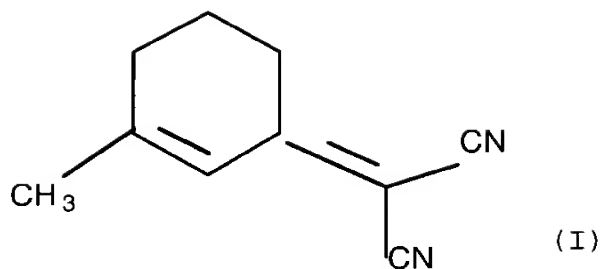
A9
cont. 25. A composition as claimed in Claim 22, wherein the composition is a liquid-crystal composition.

26. A composition as claimed in Claim 23, wherein the composition is a liquid-crystal composition.

27. A method as claimed in Claim 11, wherein R_1 , R_m , R_n , R_o , R_p , R_q , R_r , R_t , R_u , R_v , R_w , and R_x are each H; wherein A is $\text{C}(\text{CN})(\text{CN})$; and wherein D is R_y or OR_y , and wherein R_y is selected from the group consisting of the linear alkyl group, the branched alkyl group, the cyclic alkyl group, and the aryl group.

28. A method as claimed in Claim 11, wherein the compound is selected from the group consisting of

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cont.

29. A method as claimed in Claim 11, wherein when D is NR_aR_b , then α is greater than or equal to 1 and less than or equal to 25;

wherein when R_1 , R_m , R_n , R_q , and R_r are each H, and R_o , R_p , and D are each $-\text{CH}_3$, A is not $\text{C}(\text{CN})(\text{CN})$;

wherein when R_1 , R_m , R_n , R_o , and R_p are each H, and R_q , R_r , and D are each $-\text{CH}_3$, A is not $\text{C}(\text{CN})(\text{CN})$;

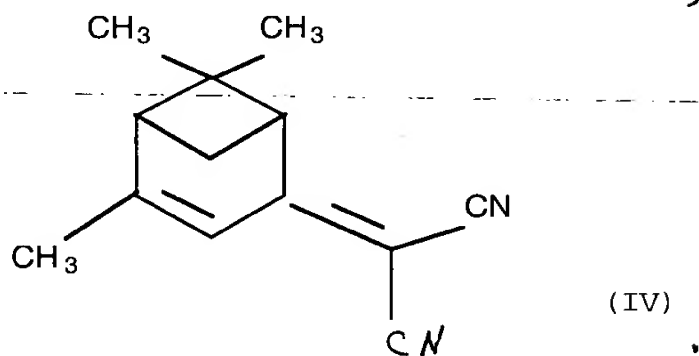
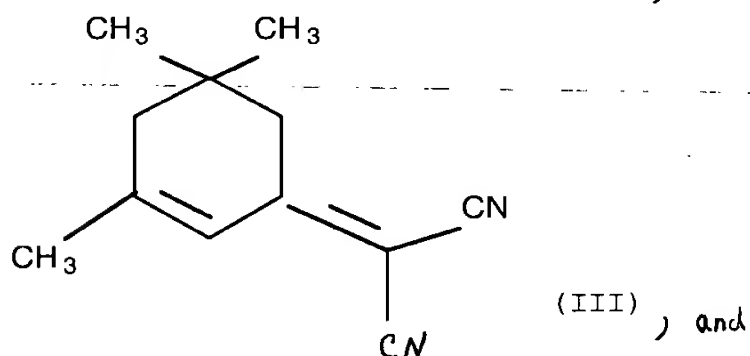
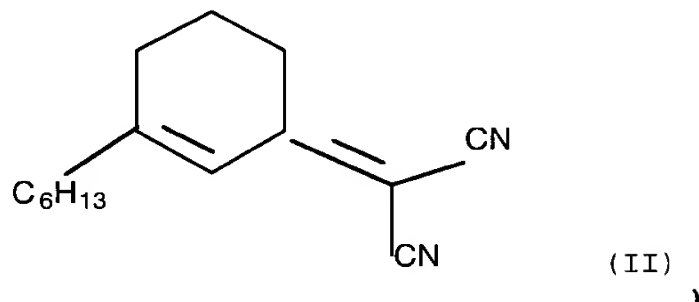
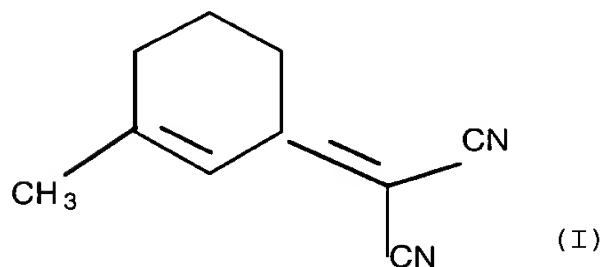
wherein when R_1 , R_o , R_p , R_q , and R_r are each H, and R_n , R_m , and D are each $-\text{CH}_3$, A is not $\text{C}(\text{CN})(\text{CN})$; and

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wherein when R_1 , R_m , R_n , R_o , R_p , R_q , and R_r are each H, and D is $-\text{CH}_3$, A is not $\text{C}(\text{CN})(\text{CN})$.

30. A method as claimed in Claim 13, wherein R_1 , R_m , R_n , R_o , R_p , R_q , R_r , R_t , R_u , R_v , R_w , and R_x are each H; wherein A is $\text{C}(\text{CN})(\text{CN})$; and wherein D is R_y or OR_y , and wherein R_y is selected from the group consisting of the linear alkyl group, the branched alkyl group, the cyclic alkyl group, and the aryl group.

31. A method as claimed in Claim 13, wherein the compound is selected from the group consisting of



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32. A method as claimed in Claim 13, wherein when D is NR_aR_b , then α is greater than or equal to 1 and less than or equal to 25;

wherein when R_1 , R_m , R_n , R_q , and R_r are each H, and R_o , R_p , and D are each $-\text{CH}_3$, A is not $\text{C}(\text{CN})(\text{CN})$;

wherein when R_1 , R_m , R_n , R_o , and R_p are each H, and R_q , R_r , and D are each $-\text{CH}_3$, A is not $\text{C}(\text{CN})(\text{CN})$;

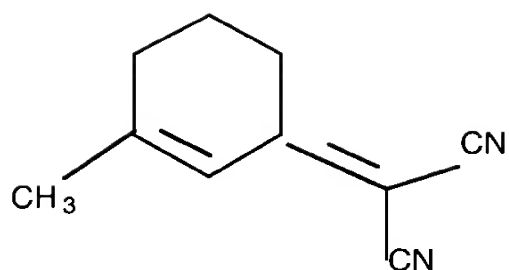
wherein when R_1 , R_o , R_p , R_q , and R_r are each H, and R_n , R_m , and D are each $-\text{CH}_3$, A is not $\text{C}(\text{CN})(\text{CN})$; and

wherein when R_1 , R_m , R_n , R_o , R_p , R_q , and R_r are each H, and D is $-\text{CH}_3$, A is not $\text{C}(\text{CN})(\text{CN})$.

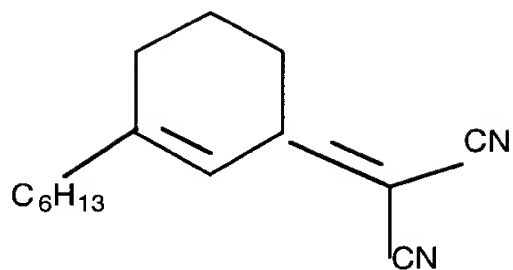
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cont. 33. A method as claimed in Claim 15, wherein R_1 , R_m , R_n , R_o , R_p , R_q , R_r , R_t , R_u , R_v , R_w , and R_x are each H; wherein A is $\text{C}(\text{CN})(\text{CN})$; and wherein D is R_y or OR_y , and wherein R_y is selected from the group consisting of the linear alkyl group, the branched alkyl group, the cyclic alkyl group, and the aryl group.

34. A method as claimed in Claim 15, wherein the compound is selected from the group consisting of

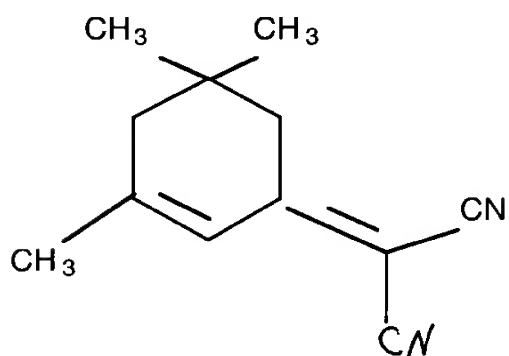
APPENDIX C



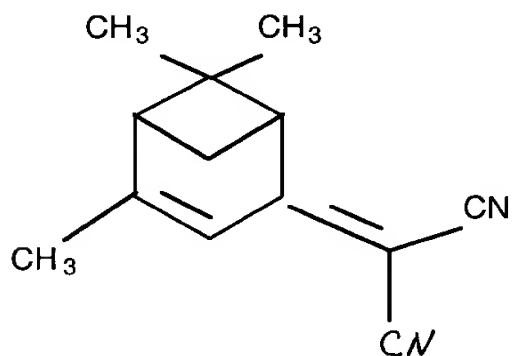
(I)



(II)



(III), and



(IV)

A9
cont.

35. A method as claimed in Claim 15, wherein when D is NR_aR_b , then α is greater than or equal to 1 and less than or equal to 25;

wherein when R_1 , R_m , R_n , R_q , and R_r are each H, and R_o , R_p , and D are each $-\text{CH}_3$, A is not $\text{C}(\text{CN})(\text{CN})$;

wherein when R_1 , R_m , R_n , R_o , and R_p are each H, and R_q , R_r , and D are each $-\text{CH}_3$, A is not $\text{C}(\text{CN})(\text{CN})$;

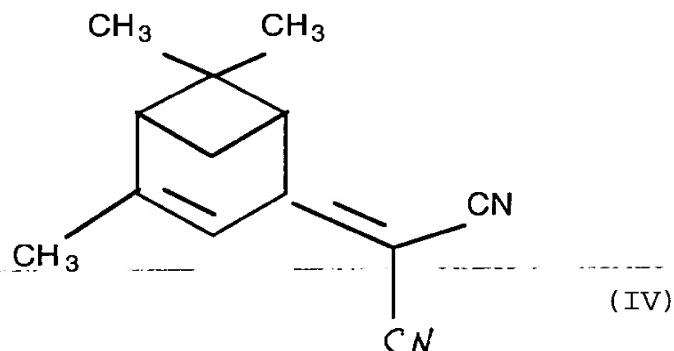
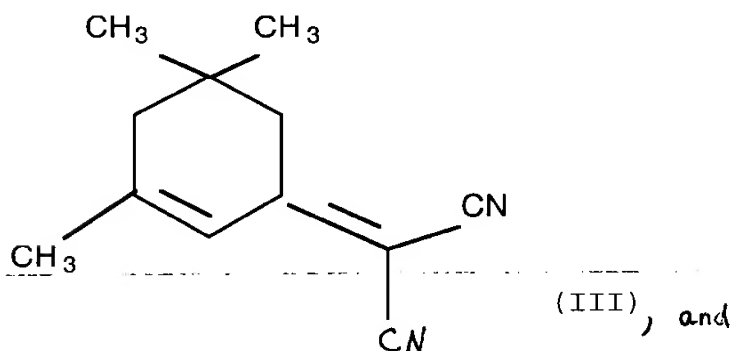
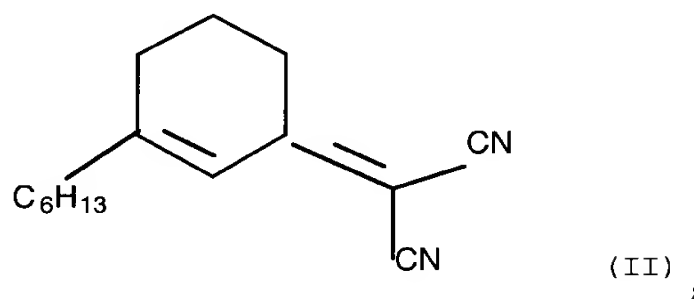
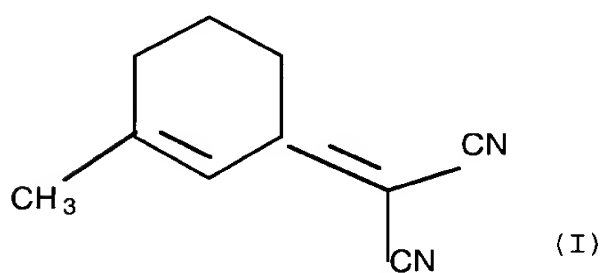
wherein when R_1 , R_o , R_p , R_q , and R_r are each H, and R_n , R_m , and D are each $-\text{CH}_3$, A is not $\text{C}(\text{CN})(\text{CN})$; and

wherein when R_1 , R_m , R_n , R_o , R_p , R_q , and R_r are each H, and D is $-\text{CH}_3$, A is not $\text{C}(\text{CN})(\text{CN})$.

APPENDIX C

36. A method as claimed in Claim 17, wherein R_1 , R_m , R_n , R_o , R_p , R_q , R_r , R_t , R_u , R_v , R_w , and R_x are each H; wherein A is $C(CN)(CN)$; and wherein D is R_y or OR_y , and wherein R_y is selected from the group consisting of the linear alkyl group, the branched alkyl group, the cyclic alkyl group, and the aryl group.

37. A method as claimed in Claim 17, wherein the compound is selected from the group consisting of



APPENDIX C

38. A method as claimed in Claim 17, wherein when D is NR_aR_b , then α is greater than or equal to 1 and less than or equal to 25;

wherein when R_1 , R_m , R_n , R_q , and R_r are each H, and R_o , R_p , and D are each $-\text{CH}_3$, A is not $\text{C}(\text{CN})(\text{CN})$;

wherein when R_1 , R_m , R_n , R_o , and R_p are each H, and R_q , R_r , and D are each $-\text{CH}_3$, A is not $\text{C}(\text{CN})(\text{CN})$;

wherein when R_1 , R_o , R_p , R_q , and R_r are each H, and R_n , R_m , and D are each $-\text{CH}_3$, A is not $\text{C}(\text{CN})(\text{CN})$; and

wherein when R_1 , R_m , R_n , R_o , R_p , R_q , and R_r are each H, and D is $-\text{CH}_3$, A is not $\text{C}(\text{CN})(\text{CN})$.--

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cont.
